REPORT ON DELAWARE RIVER FLOOD MITIGATION

NEW JERSEY FLOOD MITIGATION TASK FORCE

AUGUST 22, 2006

EXECUTIVE SUMMARY

Acting Governor Richard J. Codey established the Delaware River Flood Mitigation Task Force after two successive floods in September of 2004 and April 2005 caused widespread damage in New Jersey river towns from Trenton to Montague. For much of the affected population these were the worst floods in living memory and evidence from hydrological sources indicates that in some places they may rank second in magnitude only to the 1955 flood of record.

The Task Force has found that damage during these events was disproportionately attributable to patterns of development that are insensitive to flooding and the lack of adequate hazard mitigation planning. The Task Force further found that recovery in the aftermath of the floods was hampered by inconsistent approaches by government agencies; uncertainty and gaps in relevant rules and regulations; and regulatory and bureaucratic barriers to appropriate reconstruction. In view of continued development pressures and expected continued increases in hurricane activity over the next several decades, significant changes in policy, management, planning, and development will be needed to limit New Jersey's risk of loss from future flood events in the Delaware basin. New Jersey is the state with the fourth largest number of repetitive loss properties and fourth largest in the total amount of National Flood Insurance Program (NFIP) payouts.

The Task Force convened four public meetings in different communities, and formed committees focused on technical, funding, public education and planning issues prior to circulation of a draft report. The Task Force's recommendations, set forth in summary form below, include reforms to response, management, and regulations that may apply to flood-prone areas statewide, to the Delaware River generally, or to specific towns or tributaries. A number of recommendations are particularly appropriate for the central basin of the Passaic River, which again suffered flood losses in October 2005.

The Task Force wishes to thank the many New Jerseyans who contributed information to this investigation. A large number were themselves victims of these floods. The willingness of citizens to collaborate in support of improved flood loss reduction not only aided Task

Force inquiries but also is the foundation on which the success of the recommendations ultimately depends.

FINDINGS

The Floodplains Should Be Expected to Flood

- No set of measures, alone or in combination, will stop or eliminate flooding in the Delaware River Floodplain.
- The potential for hurricanes to be more intense and more frequent means that the risks and foreseeable consequences of flooding are increasing in magnitude.
- Timely and accurate Flood Watches and Warnings issued by the National Weather Service (NWS) are critical to saving lives and property, and improvements in communications, and in precipitation and stream gage density and technology, are needed to support the NWS mission**.**
- Better planning, stricter protection of flood plains, increased efforts to restore disturbed and developed floodplain areas, and more rational rebuilding standards can significantly reduce economic loss to New Jersey from flooding when it occurs.
- The current patchwork of floodplain delineations, many of them long out of date, must be updated if risk reduction strategies are to be effective in reducing losses.
- The Delaware River Basin Commission's (DRBC) "Recommendations to Address Flood Warning Deficiencies" must be fully implemented to provide the public with adequate response time and information as incorporated in the recommendations below.

RECOMMENDATIONS

Regulatory Protection of Flood Plains and Homes Must Be Strengthened

- The State should develop updated flood inundation maps for the Delaware River.
- The State should evaluate its existing flood hazard mapping in order to determine whether a more stringent standard should be used to define floodway boundaries.
- Regulatory stream buffers of 300 feet should be established in flood-prone areas between tributaries and any new development.
- The Delaware and Raritan Canal, currently a C1 candidate, should be reclassified on an expedited basis.
- DRBC should extend the "Outstanding Basin Waters" classification to remaining segments of the non-tidal Delaware and its tributaries as a bulwark against additional development.
- The State must adopt floodplain regulations consistent with the "No Adverse Impact" recommendations by the Association of State Floodplain Managers.
- Building rehabilitation and construction in New Jersey must be fully compliant and consistent with FEMA requirements under the National Flood Insurance Program (NFIP).

Mitigation and Control Measures Should Be Pursued

- The State, in partnership with federal and local entities, should coordinate the implementation of improvements to flood forecasting and flood warning system capabilities.
- The Task Force supports additional work by the US Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), the US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS), the NJ Office of Emergency Management (NJOEM) and the New Jersey Department of Environmental Protection (NJDEP) to conduct studies to determine the viability of Federal interest to construct or implement appropriate flood control mitigation measures. Any study should focus on local nonstructural and structural measures, and should not revisit the federal and state policy and funding decisions that terminated the proposed Tocks Island dam project.
- Engineering controls and small-scale structural controls with significant benefits in specific tributaries or river segments should be identified. Nonstructural strategies should be given a priority during consideration of flood protection solutions.
- Snowpack storage provides seasonal flood mitigation benefits downstream from reservoirs. The State should work through the DRBC's Flood Advisory Committee and the Parties to the 1954 Supreme Court Decree to foster multiparty snowpack storage agreements and to explore other opportunities for assessing the effectiveness of potential reservoir management changes.
- Buy-outs of substantially damaged properties and floodplain restoration should be more readily available to property-owners in repetitive loss areas of the flood plain. An expanded Blue Acres program, in partnership with the USACE and FEMA should be established when the Garden State Preservation Trust Act (GSPT) is reauthorized.
- It is important to maintain the structural integrity of the Delaware and Raritan Canal and to avoid increased flooding along its length. The NJ Water Supply Authority (NJWSA) should continue to work with the Delaware River towns to investigate and implement operational plans that may reduce flooding attributable to the Alexauken and Swan Creeks without adversely affecting the canal.

Planning and Additional Resources are Needed to Reduce Flood Risk

- The State must develop a robust hazard mitigation program through the addition of staffing for the NJOEM Mitigation Unit, in order to qualify for an Enhanced State Hazard Mitigation Plan under FEMA guidelines. Additional resources would also allow NJ to be more aggressive in its approach to FEMA mitigation grants and would ensure proper oversight and management of all current and future mitigation projects.
- The State must more effectively utilize available FEMA mitigation grant funding under the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Competitive Pre-Disaster Mitigation (PDM-C) grant programs, so that available funding does not continue to remain unused, as it has in the past.
- The State needs to develop its in-house capabilities to promote local hazard mitigation planning throughout the state. Currently there is a severe limitation on the number of New Jersey communities since only two are eligible for HMGP and PDM-C project grants. NJDEP should develop a Statewide Flood Prevention Master Plan to inventory flood prone areas and assess community vulnerabilities.

- The State's municipal authorities law must be amended to give municipalities the option of establishing a stormwater management utility or similar entity to manage and improve stormwater runoff from existing developments, and to facilitate access to the New Jersey Environmental Infrastructure Trust for local flood control projects.

Homeowners Need Focused Assistance Before and After Flooding

- FEMA, NJOEM, NJDEP, and local municipalities should improve coordination prior to and after flooding through homeowner assistance centers.
- The services of the New Jersey Association for Floodplain Management (NJAFM) should be utilized for public training and community outreach activities.
- NJDEP should adopt a permit-by-rule that will spare residents who rebuild their homes or other structures on residential property the expense and delay of the permitting process provided the project meets NFIP standards.
- The NJOEM, in coordination with other agencies, should develop both a user-friendly publication and a web page that explain relevant funding sources and provide common-sense help to homeowners after a flood.
- Realtors should be required to disclose at the time of sale whether a home is in a flood plain and whether it has had prior flood damage.

MEMBERS OF THE NJ FLOOD MITIGATION TASK FORCE

Honorable Bradley M. Campbell, Chairman	Commissioner of the New Jersey Department of Environmental Protection
Carol Collier	Executive Director of the Delaware River Basin Commission
Honorable David M. Del Vecchio	Mayor of Lambertville
Elizabeth Johnson	Trenton Resident and CEO of Isles, Inc.
Robert Medina, P.E.	President of Medina Consultants
John A. Miller, P.E., CFM	Senior Water Resource Engineer for Princeton Hydro, LLC
Sergeant First Class Paul Miller	State Hazard Mitigation Officer
Professor James K. Mitchell	Department of Geography, Rutgers University
Honorable Douglas H. Palmer	Mayor of Trenton
Henry S. Patterson, III	Executive Director of the New Jersey Water Supply Authority
Lt. Colonel Robert J. Ruch	Philadelphia District of the U.S. Army Corps of Engineers
Jeff Scott	Frenchtown Planning Board Chair
Cleighton D. Smith, P.E., CFM	Senior Project Manager for Dewberry & Davis
Maya K. van Rossum	The Delaware Riverkeeper
Gregory J. Westfall	USDA Natural Resources Conservation Service
Honorable Harry L. Wyant, Jr.	Mayor of Phillipsburg
Bruce Swiren	FEMA Region II

INTRODUCTION

Following a major rain storm in the last days of March 2005 and another between Friday, April 1, and Sunday, April 3, 2005, the Delaware River overflowed its banks, flooding an estimated 3,500 homes and forcing the evacuation of more than 5,500 people. This flood, the second or third worst on record depending on the specific location along the Delaware River, affected residents in Sussex, Warren, Hunterdon, and Mercer Counties, many of whom were only just recovering from major flooding caused by Tropical Storm Ivan the previous September.

In response, Acting Governor Richard J. Codey declared a State of Emergency and worked to coordinate the state's response to this natural disaster and to obtain the maximum possible federal assistance for displaced residents. In addition, on April 18, Governor Codey announced the formation of a Flood Mitigation Task Force to study and implement measures to reduce future impacts of flooding in New Jersey communities.

The Task Force was charged by Governor Codey to develop a report that would:

1. Review the causes of the April flooding;

2. Review of the responses of various government agencies; and

3. Recommend measures that can reduce the impacts and likelihood of future flooding and improve communications and assistance to residents before, during and after a flood.

The Task Force created three subcommittees to address a series of more detailed questions and tasks:

Technical Subcommittee

a. What Happened?
    1. Assess hydrology, hydraulic, meteorology;
    2. Analyze critical management decisions;
    3. Assess damages as financial impact and public assistance needs.
b. What Needs to Happen?
    1. Review river management;
    2. Assess existing technologies for planning, mitigation, and early warning systems;
    3. Analyze infrastructure improvement needs and opportunities for reduction of vulnerability through mitigation projects; and

4. Assess land use management and property acquisition and land restoration potentials.

Funding Subcommittee

a. Where the Money Comes From?
   Review all available financial resources.
b. Where Do We Need to Put the Money?
   Assess immediate and future funding needs and opportunities.

Community Outreach and Public Education Subcommittee

a. What Information is Available Now for Public Release?
   Review and appropriately package information for Task Force public meetings and general release.
b. What Information is Needed?
c. How Information is Best Distributed?

The Task Force hereby presents its findings and recommendations.

BACKGROUND

Between Friday, September 17th and Saturday, September 18th 2004 the remnants of Hurricane Ivan interacted with a weather front to produce heavy rain across northwestern New Jersey and the Catskill Mountains of New York. Doppler radar estimates of total rainfall for the 24-hour period were about 4 to 6 inches over the region, with heavier amounts reported locally. Above average rainfall during the proceeding months resulted in moist soils, higher than average streamflows, and reservoirs near capacity. On September 9th and 10th, over two inches of rain was recorded across the upper Delaware River basin, increasing the above average streamflows observed throughout the summer. All three New York City (NYC) reservoirs, which are located in this area, were at 99 percent capacity, which is unusually high for the time of year.

Less than one year later, three conditions set the stage for the worst flooding in 50 years along the mainstem of the Delaware River: (1) rainfall totaling as much as 5 inches during April 2-4, 2005; (2) saturated ground caused by more than 2 inches of rain that fell less than a week earlier together with snow cover in the Pocono and Catskill Mountains; and (3) reservoirs filled to capacity. Gages along the Delaware River recorded flow consistent with 80-year to greater than 100-year floods. Peak flows on other streams across New Jersey, including tributaries to the Delaware River, did not exceed the 20-year recurrence interval.

Precipitation

Rain fell mainly from the early morning hours of April 2 for twenty-four hours to April 3. The heaviest rain fell across the upper Delaware watershed region, including parts of northwestern New Jersey, northeastern Pennsylvania, and southeastern New York. Rain gages in Morris, Passaic, and Sussex Counties of New Jersey recorded more than three inches of rain. Rain gages at Slide Mountain and Rock Hill in southeastern New York, recorded more than 4 inches of rain. More than 5 inches of rain was recorded by rain gages at Blakeslee, Lehighton, and Mount Pocono in northeastern Pennsylvania. Generally, less than 2 inches of rain fell in central and southern New Jersey and less than 1 inch fell along the southern coast. Doppler-radar-based estimates of total rainfall for the 24-hour period ending at 0700 hours EDT on April 3 were 2 to 4 inches over western New Jersey, north of Mercer County. Five rain gages operated by the U.S. Geological Survey (USGS) across the

upper Delaware River Basin in New York and Pennsylvania recorded from 2.94 to 3.54 inches of rain from April 2 through April 4 (Gary Paulachok, USGS, written communication, 2005). Rainfall at the five gages averaged 3.2 inches. These rainfall amounts may seem unremarkable for any particular location, however, the extent of the rainfall area combined with various hydrologic conditions discussed below, created large amounts of runoff within the watershed.

Antecedent Conditions

Saturated ground contributed to the flooding that resulted from the April 2-4 rainfall. Precipitation totals for the 12-month period ending February 28, 2005, were 7.5 inches, 4.5 inches, and 2.0 inches above normal at Trenton, Newark, and Atlantic City, respectively. Above-average rainfall during the preceding 12 months and more than 2 inches of rainfall across the region on March 28-29 resulted in higher than average streamflows. Saturation limits the absorption of rainfall into the ground, therefore resulting in increased runoff.

Melting snow in southeastern New York also contributed to the high flows on the mainstem of the Delaware River. The water equivalent of snow on the ground in the Pocono Mountains region of Pennsylvania and the Catskill Mountains region of New York ranged from 2 to 3 inches before the storm. Melting of the snow pack contributed significantly to the total runoff volumes.

Reservoirs

Due to the above average precipitation preceeding the event, reservoirs in the upper Delaware River Basin were at capacity and spilling at the time of the storm. The Cannonsville and Neversink Reservoirs were spilling prior to the March 28-29 storm, and the Pepacton Reservoir began spilling after the March 28-29 storm (Gary Paulachok, USGS, oral communication., 2005). These reservoirs are water supply reservoirs owned by the City of New York and are not intended for flood control. However, Cannonsville, Pepacton and Neversink Reservoirs did retain runoff and provided respectively 38%, 30%, and 20% reductions over peak inflows to the reservoirs. This helped to attenuate downstream flood flows.

For only the eighth time in eighty years flood waters spilled from Lake Wallenpaupack. This reservoir, which is located in Wayne County, Pennsylvania was constructed in 1926 as a hydroelectric generating facility and owned by Pennsylvania Power and Light. The drainage area to Lake Wallenpaupack is 228 square miles (approximately 6.5% of the total Delaware drainage area to Port Jervis). Releases began Sunday morning, April 3, at 0330 hours and (ended) Monday, April 4, at 0900 hours (Gary Paulachok, USGS, oral communication., 2005). The peak release from the reservoir was 8000 cfs while the maximum inflow to the reservoir was 21,000 cfs. The reservoir stored approximately 6.7 billion gallons of water during the rainfalls of April 2nd and 3rd as well as an additional 7.3 billion gallons from the prior rain event at the end of March. The diminished peak outflow resulted in a minor reduction of water surface elevation in the Delaware River at Port Jervis, but no measurable effect further downstream.

Four major USACE flood control dams are located in the Delaware Basin in Pennsylvania above Trenton. These include the Beltzville Dam, the Francis E. Walter Dam, the Prompton Dam, and the General Edgar Jadwin Dam. Combined, these reservoirs stored approximately 23.5 billion gallons of runoff from this storm event. This amount of runoff storage reduced the level of flooding on the Delaware River. In New Jersey, no reservoirs located in the Delaware River basin, including the Merrill Creek Reservoir, released during the floods.

Peak Flows and Stages

Gaging stations on the mainstem of the Delaware River recorded higher flooding than any other stream in New Jersey as a result of the April 2005 storm. Flood peaks along the mainstem of the Delaware River were 1 to 3 feet higher than those of the September 2004 flood and the highest since the flood of August 1955. Peak flows at three of the five gaging stations between Montague and Trenton, New Jersey exceeded the 100-year flood event. Peak flows recorded by stream gages on the major tributaries to the Delaware River in New Jersey from the Musconetcong River north to Flat Brook indicated the occurrence of 8-year to 20-year floods. Peaks recorded by gaging stations on the Pompton, Ramapo, and Wanaque Rivers in the Passaic River Basin indicated 15- to 20-year floods. Peaks recorded by gaging stations in the Coastal Plain of southern New Jersey and much of central New Jersey indicated less than 5-year floods.

The flood peak on the Delaware River at Montague, New Jersey was the second highest recorded. The peak flow of 206,000 ft^3/s (cubic feet per second) on April 3 at 1600 hours indicated about an 80-year recurrence-interval flood. Flood-frequency statistics at this site are based on annual peak-flow data from 1936 through 2005. The peak stage recorded for this flood was 31.69 ft (feet), 3.46 ft below the historical peak of 35.15 ft set on August 19, 1955. The peak stage was 6.69 ft above flood stage and 3.32 ft higher than the September 2004, peak.

The flood peak on the Delaware River near Delaware Water Gap, Pennsylvania was the second highest recorded. The peak flow of 215,000 ft^3/s was about an 80-year recurrence-interval flood. Flood-frequency statistics at this site are based on peak-flow data from 1965 through 2005 and the 1955 historical peak. The peak stage recorded was 33.25 ft, about 4.20 ft below the historical peak of 37.4 ft recorded on August 1955. This peak was 12.25 ft above flood stage and 2.93 ft higher than the September 2004, peak.

The flood peak on the Delaware River at Belvidere, New Jersey was the third highest recorded. The peak flow of 223,000 ft^3/s on April 4 at 0315 hours exceeded a 100-year recurrence-interval flood. Flood-frequency statistics at this site are based on peak-flow data from 1923 through 2005 and a historical peak from 1903. The peak gage height recorded for this flood was 27.24 ft; 2.97 ft below the previous record of 30.21 ft set on August 19, 1955. This peak was 5.24 ft above flood stage and 2.41 ft higher than the September 2004, peak.

The flood peak on the Delaware River at Riegelsville, New Jersey was the third highest recorded. The peak flow of 262,000 ft^3/s on April 4 was greater than the 100-year recurrence-interval flood. Flood-frequency statistics at this site are based on peak-flow data from 1907 through 2005, and historical peaks from 1841 and 1903. The peak stage recorded for this flood was 34.07 ft; 4.78 ft below the previous record of 38.85 ft set on August 19, 1955. This peak was 12.04 feet above flood stage and 2.41 feet higher than the September 2004 peak.

The flood peak on the Delaware River at Trenton, New Jersey was the third highest recorded since 1902. The peak flow of 242,000 ft^3/s on April 4 at 1430 hours exceeded the 100-year recurrence-interval flood. Flood-frequency statistics for this site are based on peak-

flow data from 1913 through 2005 and an historical peak from 1904, as well as historic flood-peak information from earlier floods. The peak stage recorded for this flood was 25.33 ft, 3.27 ft less than the flood of August 1955.

FINDINGS AND RECOMMENDATIONS

Regulatory Protection of Flood Plains and Homes Must Be Strengthened

Finding 1: Existing floodplain mapping along the Delaware River is based on pre-1985 studies that underestimate the current 100-year flood elevation, the floodways, and flood hazard areas. Along common stretches of river, current maps for New Jersey are not consistent with those of Pennsylvania. State delineation mapping upstream of Trenton extends from Ewing Township to Harmony Township. New development could be proposed in areas that are not identified as floodplain on existing maps.

The NJDEP is working together with FEMA to complete a five-year digital map modernization program, based on countywide studies rather than municipal studies. The countywide studies insure more consistent information between municipalities and provide a digital environment that allows for easier revisions and updates.

Recommendation 1: The NJDEP in coordination with federal entities (e.g. USGS, USACE), should develop new floodplain delineations and associated mapping for the main stem of the Delaware River. The new study should include updated hydrology, verification of stage discharge curves, state of the art hydraulic modeling and new delineations.

Before initiating the study there should be concurrence on the methodology among DRBC, FEMA, NJDEP, NWS, and the Pennsylvania.

The new delineations should be used to produce inundation maps for emergency management and serve as basic input to FEMA's map modernization initiative. (Map modernization is scheduled for New Jersey counties as follows: Mercer and Hunterdon Counties (FY2006), Sussex County (FY2008), and Warren County (FY2009)). Taken together, the NJDEP maps (verified by field inspection), inundation maps and modernized FIRM (flood insurance rate) maps should yield the most credible state of the art floodplain delineations.

Implementation 1: NJDEP-Engineering & Construction

Finding 2: The State's flood hazard area mapping greatly underestimates the limit of the floodway along the Delaware River. The current New Jersey State floodway standard, which allows for only a 0.2 ft. rise in flood depths, is more demanding that the FEMA floodway standard, which allows for a 1.0 ft rise. However, the less stringent FEMA standard was used to delimit the floodway in order to avoid inconsistencies between different floodway criteria on the New Jersey and Pennsylvania sides of the river. As a result the designated floodway is extremely narrow and new construction is permitted in close proximity to the river. Portions of Trenton, Lambertville, Stockton, Frenchtown, and other river communities would likely lie within the mapped floodway of the Delaware River if the State floodway standard had originally been used.

Recommendation 2: The floodway limit along the Delaware River should be remapped using the same New Jersey floodway standard that is used for the rest of the State's flood hazard area mapping.

Implementation 2: NJDEP-Engineering & Construction, NJDEP-Land Use Regulation Program

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Finding 3: The State's flood hazard area mapping often underestimates the width of floodways along New Jersey's streams and rivers. The floodway, which is the inner portion of the flood hazard area nearest the stream or river, is characterized by deeper flows and higher velocities during a flood. New construction is generally prohibited in floodways because it is unsafe and obstructs the passage of floodwaters. However, areas immediately adjacent to floodways are often subject to flood depths and velocities similar to those of the floodway. New construction is sometimes improperly permitted in these adjacent areas simply because they are not currently demarcated as floodways.

Recommendation 3: NJDEP should evaluate its existing flood hazard mapping in order to determine whether a more stringent standard should be used to define floodway boundaries. Specifically, a comparison should be made between the current mapping protocol, which uses a 0.2-ft rise in flood depths to delineate floodways, with floodway boundaries calculated using a 0.1-ft rise, which is more conservative and likely to expand floodway widths. Such a change could help to prevent new construction in close proximity to streams and rivers in many areas. If the NJDEP subsequently determines that re-mapping its floodways is necessary to ensure that the public is adequately protected from the hazards of new construction in areas prone to severe flooding, the State should then adopt the 0.1-ft floodway standard for flood hazard mapping Statewide.

Implementation 3: NJDEP-Engineering & Construction, NJDEP-Land Use Regulation Program

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Finding 4: The current flood control rules do not adequately preserve flood storage along streams and rivers. Whenever development occurs within a flood hazard area, buildings and other materials occupy a certain volume above ground that would otherwise be occupied by floodwaters during a flood. The cumulative displacement of flood storage in this way causes the depth and velocity of flooding to increase, since floodwaters must seek other areas to occupy. The current rules allow up to 20% of the existing flood storage on a site to be displaced by development (20% net-fill). Within the Central Passaic Basin, all flood storage displacement must be mitigated by the creation of an equal volume of flood storage elsewhere in the basin (0% net-fill). However, this compensatory flood storage is often created miles from the proposed development and sometimes situated along a different stream entirely.

Recommendation 4: The rules should be amended to prevent any net-displacement of flood storage statewide (0% net-fill) except in cases of clearly proved public need or hardship. If a proposed development does displace flood storage on a site, an equal volume

of flood storage should be created in close proximity to the construction. Preserving flood storage in this way ensures that development will not exacerbate flooding.

Implementation 4: NJDEP-Land Use Regulation Program

Finding 5: The current rules focus on the impacts that flood storage displacement may cause during a 100-year flood, while ignoring the potentially adverse impacts of flood storage displacement on smaller flood events. Development can therefore occur in such a way that there is little or no flood storage displacement during larger floods, while much of the flood storage during smaller flood is consumed by construction. This is also true for hydraulic modeling for bridges, culverts and flood control projects, which is generally performed solely to demonstrate regulatory compliance during large flood events. This has created a situation where development does not cause flood depths to rise during larger floods, but greatly alters the depth and frequency of flooding during smaller floods.

Recommendation 5: The rules should be amended to require projects to demonstrate compliance with regulatory standards for smaller, more frequent flood events, such as the 10-year flood, in addition to the larger flood events. For example, flood storage displacement calculations, which are currently performed only for the 100-year flood, should be performed for both the volume of the 10-year flood and the volume between the 10-year and 100-year floods. This would ensure that development would not cause adverse flooding impacts over a range of flood events.

Implementation 5: NJDEP-Land Use Regulation Program

Finding 6: The current rules do not allow the NJDEP to review potential adverse flooding impacts along streams that have contributory drainage areas of less than 50 acres. However, NJDEP's position is that flooding due to development along these smaller streams has increased in recent years.

Recommendation 6: The rules should be amended to require a demonstration of no adverse impact to flooding from development along any stream that has a definable channel (regardless of contributory drainage area) as well as any stream that has a contributory drainage area of over 25 acres. The presence of a channel is indicative of persistent flow, thus warranting the review of potential impacts to flooding caused by development along such features. Similarly, it is NJDEP's experience that any feature having a contributory drainage area of over 25 acres has enough flow to warrant a review of potential impacts to flooding caused by development. Preserving flood storage and establishing appropriate riparian buffers along these headwater areas is essential to any comprehensive watershed management plan.

Implementation 6: NJDEP-Land Use Regulation Program

Finding 7: Flood hazard area mapping is not available for the majority of the New Jersey's smaller streams. Therefore the extent of flooding in many areas of the state is completely unknown. Without flood mapping, prospective developers as well as existing property owners are forced to employ consultants to perform costly delineations of the flood hazard area in order to determine NJDEP's regulatory authority.

Recommendation 7: A method for conservatively approximating flood elevations along unmapped streams has already been developed by NJDEP and should be incorporated into the rules. Providing a simple and inexpensive way to conservatively approximate flood hazard areas will encourage individuals to locate new development outside such areas and will equip existing property owners with a means to estimate the flood damage potential of a site. This methodology should be published on an official NJDEP web site for general distribution.

Implementation 7: NJDEP-Land Use Regulation Program

Finding 8: The current rules do not generally allow the use of FEMA flood insurance rate maps for regulatory purposes. This is due to the fact that FEMA mapping indicates the 100-year flood elevation, whereas state flood mapping indicates the elevation of the flood hazard area design flood (which is 25% greater than the 100-year flood). However, FEMA flood mapping is often more recent, and therefore more accurate, than the state flood mapping, and FEMA mapping exists in some areas where no state flood mapping is available.

Recommendation 8: The state's flood hazard area design flood elevation is generally 1 ft above the FEMA 100-year elevation. The regulatory flood elevation should be based on either the state flood hazard area elevation or 1 ft above the FEMA 100-year elevation, whichever is higher. As state and FEMA maps are updated, the more recent and accurate flood elevation will continually be referenced for regulatory purposes. The rules should furthermore be amended to require that the lowest floor of habitable structures be constructed at least 1 ft above the regulatory flood elevation to provide an adequate factor of safety.

Implementation 8: NJDEP-Land Use Regulation Program

Finding 9: The current regulatory framework discourages flood mitigation and prevention activities associated with existing structures.

Recommendation 9: Permits-by-rule should be created specifically for home and business owners who intend to perform flood mitigation and prevention efforts, such as elevating or relocating existing structures, rather than requiring the submittal of an actual permit application. Conflicting requirements between FEMA, NJDEP, and the International Building Code (IBC) should be identified and eliminated wherever possible, especially in cases where displaced owners are unable to rebuild or modify their home or business as a result of these conflicts. A single joint application should also be developed consistent with NFIP standards.

Implementation 9: NJDEP-Land Use Regulation Program

Finding 10: The near-stream buffers established by the current rules are too narrow to adequately preserve channel integrity, maintain water quality or provide suitable riparian habitat.

Recommendation 10: NJDEP should establish standardized riparian buffers in the State's Surface Water Quality Standards along all freshwater streams and rivers. These buffers should vary in width from 75 ft to 300 ft according to the resource classification and geographic location of the stream in question. The current rules merely establish a 50-ft vegetative buffer along streams and rivers having certain environmental resources, and a 25-ft vegetative buffer along all other streams and rivers.

Implementation 10: NJDEP-Land Use Regulation Program

Finding 11: The majority of the Delaware River basin lies within Pennsylvania and New York, both of which have less stringent construction and flood prevention standards than New Jersey. These inconsistencies are likely to cause increased flows into the Delaware River basin, leading to greater flooding potential along New Jersey's portion of the river.

Recommendation 11: Every effort should be made to encourage Pennsylvania and New York, via the DRBC, to adopt the same stringent construction standards and flood hazard area restrictions within the Delaware River basin as New Jersey. Consideration should be given to the establishment of a joint working group to implement the standard.

Implementation 11: DRBC

Finding 12: NJDEP's Land Use rules do not offer consistent construction and flood prevention standards.

Recommendation 12: NJDEP should evaluate its existing regulatory programs to identify conflicts and coordinate flood prevention efforts. This evaluation should include all land use regulations including freshwater wetlands, stream encroachment, waterfront development, CAFRA, and the state's stormwater management rules, which establish 300-ft buffers along C1 waters.

Implementation 12: NJDEP- Land Use Regulation Program

Finding 13: The State's existing Flood Hazard Area Control Act rules at N.J.A.C. 7:13 do not consistently reflect the "No Adverse Impact" recommendations of the ASFPM. These recommendations stress that the action of one property owner should not adversely impact the rights of other property owners, as measured by increased flood peaks, flood stage, flood velocity, erosion and sedimentation. A number of provisions under the current rules do not adequately address such impacts that are sometimes caused by development in flood hazard areas.

Recommendation 13: The State should carefully review the existing Flood Hazard Area Control Act rules and adopt new rules that are consistent with the "No Adverse Impact" recommendations of the NJAFM.

Implementation 13: NJDEP-Land Use Regulation Program

Finding 14: The Delaware and Raritan Canal is instrumental for providing drinking water for a large number of central New Jersey residents, and its close proximity to the Delaware River and many of its tributaries provides essential flood storage within the Delaware River basin.

Recommendation 14: The Delaware and Raritan Canal, currently a candidate for C1 status, should be reclassified as such on an expedited basis.

Implementation 14: NJDEP- Division of Watershed Management

Finding 15: The DRBC has proposed amendments to the Commissions Water Quality Regulations, Water Code and Comprehensive Plan to classify as Special Protection Waters the reach of the main stem of the Delaware River known as the "Lower Delaware" which extends from the boundary of the Delaware Water Gap National Recreation Area to the head of tide at Trenton, New Jersey. To be protected as Special Protection Waters, stream reaches must be classified as either "Outstanding Basin Waters" or "Significant Resource Waters." "Outstanding Basin Waters" are defined as "interstate and contiguous intrastate waters that are contained within the established boundaries of national parks; national wild, scenic and recreational rivers systems; and/or national wildlife refuges that are classified by the DRBC as having exceptionally high scenic, recreational and ecological values that require special protection."

Recommendation 15: DRBC should extend the "Outstanding Basin Waters" classification to remaining segments of the non-tidal Delaware and its tributaries.

Implementation 15: DRBC

Finding 16: Building rehabilitation and construction in New Jersey is not always fully compliant with FEMA requirements under the NFIP. Flood damaged structures are rebuilt in the same location without meeting the minimum standards of the NFIP.

Local floodplain administrators, often with dual roles as code officials, are charged through local ordinances with enforcing NFIP requirements. However, they often lack the training and experience to fully understand the NFIP requirements, to identify whether proposed construction is located in a floodplain, or how to perform substantial damage inspections. Substantial damage declarations are key to ending the cycle of repetitive loss (flood, rebuild, flood).

There is a need for better inter-agency cooperation to achieve the required flood mitigation goals. This has resulted in the state's failure to receive the federal mitigation funds to which it is entitled.

New Jersey is in the top five in the United States in the number of repetitive flood loss properties. This creates a financial drain on the NFIP and keeps premiums high for all policyholders. FEMA has a high national priority to reduce the numbers of repetitive loss properties.

Recommendation 16: The State needs to adopt the NFIP regulations in their entirety. Adoption of the NFIP regulations means that municipalities would adopt local ordinances incorporating the NFIP requirements. Also, the NJDEP, Land Use Regulation Program should consider incorporating some of the requirements of the NFIP regulations into their program.

Local construction permits should not be issued until prior approval by the local floodplain administrator has been obtained. This is already the case under the Uniform Construction Code. This prior approval must be in writing and ensure that the project fulfills the requirements of the NFIP. After a flood, the local floodplain administrator should perform substantial damage inspections.

The State needs to provide training to local officials in floodplain administration and in doing substantial improvement evaluations for building permits and substantial damage inspections after a flood. Training should be provided through the NJDCA code official licensure and continuing education program and through FEMA's Emergency Management Institute (EMI) in Emmitsburg, MD. EMI is an excellent instructional facility and provides training at minimal cost to local officials. Tuition, travel, and lodging are paid by EMI (meal tickets are all that trainees need to pay). Once trained, the official's administration as a local floodplain manager can be evaluated during Community Assistance Visits/Contacts (CAV/CAC) conducted by the NFIP Coordinator's office (NJDEP). Local floodplain administration is required under the NFIP.

Enforcement of the local floodplain administrator's responsibilities under the NFIP should be a coordinated effort between the NFIP Coordinator's office (NJDEP), FEMA, and NJDCA.

An inter-agency group focused on flood mitigation needs to be created within New Jersey. Collaboration in support of the NJOEM will ensure better use of the mitigation funds already assigned to New Jersey and will create an incentive for FEMA to fund more projects. Interagency cooperative efforts in other states (e.g. Illinois) provide appropriate models for New Jersey.

The State needs to develop a Repetitive Loss reduction strategy, initially for the Delaware River, but eventually for the entire state. The key to this strategy will be to identify the top repetitive loss communities in the state and, through an incentive-based system, provide local officials in those communities with training needed to carry out substantial damage inspections, identify mitigation alternatives, estimate the Increased Cost of Compliance (ICC) and establish flood insurance coverage. Funding and assistance should be based on the following priority indicators:

- Record of past flooding
- Availability of county/municipal and/or property owner funding
- Municipal participation in the NFIP
- Municipal participation in the Community Rating System (CRS)

- Status of local hazard/flood mitigation plan and its implementation
- Record of local code enforcement in the flood plain
- Operation and maintenance of existing flood protection infrastructure by local government

Implementation 16: NJDCA, FEMA, NJDEP-Engineering & Construction, NJDEP-Land Use Regulation Program, NJAFM

Mitigation and Control Measures Should Be Pursued

Finding 17: After the April 2005 flood, public hearings in both New Jersey and Pennsylvania received comments on the lack of coordinated management of water supply reservoirs for flood control. The New York City water supply reservoirs and the Lake Wallenpaupack and the Mongaup hydroelectric facilities are not designed for flood control. These reservoirs have no designated flood storage capacity, and their outlet works are too small to allow the rapid release of storage required for effective flood control facilities.

In addition, the use of water supply reservoir capacity for flood storage potentially impacts water supply capability and is an issue for the reservoir owners. If reservoirs were used to control flooding, they would not be able to provide ample supply of water during drought.

One management option that was implemented prior to the April 2005 flood was the lowering of storage in one of the NYC reservoirs, the Pepacton Reservoir, in response to the water equivalent in the accumulated snowpack. Such a program was first implemented in the winter of 1997 on a one-time basis. In 2005, the parties to the 1954 Supreme Court Decree, who must unanimously approve changes to the use of storage in the Upper Delaware, approved a temporary program to reduce the storage in Pepacton Reservoir by up to 50 percent of the accumulated snowpack. This resulted in a storage void prior to the first rainfall event, on March 28-29, of approximately 10 billion gallons. The available flood

storage capacity eliminated a spill of approximately 7,000 cubic feet per second from the first storm at Pepacton Dam. Runoff from the second storm on April 2-3, and continuing snowmelt subsequently caused the reservoir to spill. The decree parties are considering agreements which would establish snowpack based storage reduction programs at Pepacton and Neversink reservoirs, and a similar program for Cannonsville may be considered pending improvements in snowpack monitoring in that watershed. The daily snowpack reports of the National Operational Remote Sensing Center of the National Weather Service (NWS) with incorporation of snow survey monitoring by the City of New York, is expected to improve the timeliness of accurate snowpack data for use in reservoir management.

Recommendation 17: Use of snowpack based storage management programs for water supply reservoirs should be evaluated, while recognizing the limited seasonal availability and marginal risk reduction offered by this type of flood mitigation. Evaluation of such programs must consider the water supply risk incurred to the 1954 U.S. Supreme Court Decree Parties in their implementation. In the Upper Delaware River Basin, such programs require unanimous approval of the decree parties.

Although snowpack based storage reduction programs may provide some seasonal flood mitigation benefit in the tailwater areas immediately downstream of the dams, they cannot be relied upon to reduce flood peaks along the mainstem Delaware River. This is due to the intervening uncontrolled drainage area, the seasonal nature of such programs, lack of flood control design of reservoir outlet works, and relationship to interstate water rights.

The coordination of reservoir operations before and during flood events is an issue that has been raised frequently during the period subsequent to the April flooding. Available hydrologic information and modeling have indicated that the reservoirs reduced the April flood crests when compared to unregulated conditions. However, an engineering design model for evaluating operation of the basin's reservoirs during flood events does not exist. An engineering study using such a model could provide an experimental means for determining the effectiveness of potential reservoir management changes in reducing flood peaks. Accordingly, it is recommended that the feasibility and cost of doing model development and an engineering study be evaluated.

At the October 5, 2005 DRBC Flood Advisory Committee (DRBC FAC) Meeting, it was agreed that the NWS would examine the potential for use of its flood routing model as a means of comparing the effects of different outflow hydrographs from reservoirs. This would be a first step in determining the need for further model development and engineering design studies.

Currently, the NWS models inflow to the Cannonsville and Pepacton Dams. These water supply reservoirs are operated by the New York City Department of Environmental Protection (NYCDEP). Before operations each morning, the NWS Middle Atlantic River Forecast Center (MARFC) receives from NYCDEP data for pool elevations and outflows from Cannonsville and Pepacton Dams for the preceding 24 hours at the 6-hourly times of 1pm, 7pm, 1am, and 7am. The MARFC is also receiving precipitation data from NYCDEP. The NWS API-Continuous and SNOW-17 models are then run, routing the outflows from these dams, in addition to the runoff from other upstream basins, downstream to obtain flow and stage forecasts for various forecast points in the Delaware Basin.

The MARFC is currently developing procedures to model Neversink Reservoiras is similarly done for Cannonsville and Pepacton Reservoirs. That, combined with outflow data from Neversink Dam each morning, will allow the NWS to produce forecasts for Bridgeville on the Neversink River on an as needed basis during times of high water. The water from Bridgeville will then be routed to Montague on the Delaware River, theoretically providing a better estimation of the flow at that point, which could improve forecasts further downstream on the Delaware.

Implementation 17: DRBC, NWS

Finding 18: The US Congress must continue to fund the feasibility study phase of USACE's Delaware River Basin Comprehensive Study. The reconnaissance study phase established federal interest in pursuing a detailed feasibility study to evaluate flood damage reduction measures in the Delaware River watershed.

Federal funding for the feasibility study is included in the Senate mark up of the Federal FY06 budget. NJDEP, a potential non-federal sponsor, has committed at least $500,000 for use in the state match in cost sharing the feasibility study. As part of this study, the USACE should review the USACE August 1984 report, which addressed the flooding along the main stem of Delaware River downstream of Port Jervis. The study should focus on local protection measures along the main stem of the Delaware River and tributaries.

Recommendation 18: State and local leaders must encourage the US Congress and Senate to support/fund the USACE feasibility study of the Delaware River Basin in subsequent Federal budgets.

Implementation 18: USACE, NJDEP-Engineering & Construction

Finding 19: The concept of the Tocks Island Project and any other major structural control project on the Delaware River main stem are not viable. In July 1992, the Tocks Island project was de-authorized by Congress. Project review demonstrated a number of economic and environmental concerns associated with the project as well as significant public opposition. Implementation for any future construction of the Tocks Island Project would require that Congress remove the designation of the Delaware River as a Wild and Scenic River. Congress would be required to approve both study and funds in order for the USACE to fully re-evaluate this project in view of today's needs and regulatory regulations. Recreation, one of the primary project features, has already been implemented through the designation of the Delaware Gap National Recreation Area.

If Congress provides the USACE the authority and funding to re-study the project, a non-federal sponsor would be additionally required who would be willing to cost share the study, and subsequent design and construction if it were identified as viable. Implementation would likely require a great deal of time and effort, more than a decade, for the study, environmental coordination, design, construction, assuming Congress and non-federal sponsor provide optimum funding throughout the process.

Recommendation 19: Tocks Island Dam should not be pursued for consideration.

Implementation 19: No Action

Finding 20: Floodplain acquisition will be key to state flood control efforts. Removal of structures and restoration of floodplain areas provides permanent protection for the participating flood victims while at the same time providing floodplain restoration that provides flood control and other environmental and quality of life benefits to the rest of the community. The "Green Acres, Farmland, Historic Preservation, and Blue Acres Bond Act of 1995" provided $30,000,000 for the acquisition of areas that are prone to flooding and damage from storms. Of the $30 million, $15 million was programmed for grants and loans to municipalities and counties for the acquisition of coastal areas. The other $15 million was programmed for direct state acquisition of houses in the Passaic River Basin. To date, the efforts in the Passaic River Basin have resulted in the purchase of 124 houses.

Additionally, any municipality or county can purchase any land for the purpose of preservation under the Green Acres Local Assistance Program. Flood prone properties are eligible. A portion of the funds to administer the Green Acres Local Assistance Program comes from the GSPT. However, the municipal portion of the Green Acres Funding will run out sooner than anticipated.

Another potential source of funding is through the Environmental Infrastructure Trust. Under the Environmental Infrastructure Financing Program (EIFP), a number of sites are purchased each year in coordination with the Green acres program combining low interest loans and Green Acres grants. The land to be purchased must be environmentally sensitive (such as floodplains) and the local community must agree not to allow any future activity.

Recommendation 20: The state, county and local governments should push a concerted effort to better utilize the existing Green Acres and Environmental Infrastructure Trust funding sources for the purposes of purchasing and preserving flood prone lands in the

Delaware River Basin. Additional Blue Acres Funding funds for an aggressive buyout program should be sought through additional Bond Acts. The Delaware River Basin should be a priority area for State buyout and funding efforts.

Implementation 20: NJDEP-Green Acres; legislation needed

Finding 21: The Delaware River Basin contains levees and large flood control dams in addition to impoundments not designed for flood control. Failure of these projects can result in flood damage exceeding that of the unregulated flood. Also, backwater flow conditions along stream tributaries to the Delaware River has contributed to the flooding of areas adjacent to these tributaries.

Structural failures often occur during or after severe flood events. Failures may be caused by events, which exceed the design capability of the structure, or by the lack of adequate maintenance. Nationally, examples of failure range in scale from the breaching of small dams to the failure of levees inundating hundreds of square miles. The inspection of facilities has been a programmed federal and state activity, but addressing maintenance shortcomings often requires adequate funding and follow-through by local or private facility owners. These activities are a critical part of overall flood loss reduction and the risk of flood damage and loss of life increases without them.

The flooding from Tropical Storm Ivan and the April 2005 flood has renewed the interest of many floodplain residents in the development of new structural projects. There are currently no large flood control facilities being designed or constructed in the Delaware River Basin. Factors such as scenic river designations, local cost sharing requirements for federal projects, and ecological impacts, have drastically reduced consideration of these alternatives. Instead, the application of measures such as property acquisition, building elevation, better stormwater management, and more stringent flood plain regulation is increasing in the basin.

In the early 1980's, the USACE conducted an evaluation of structural and non-structural local mitigation measures. From that investigation, a great deal of data was collected. As part

of the proposed Delaware River Basin Comprehensive Feasibility Study, the USACE should re-evaluate local flood damage mitigation measures to determine current viability.

Recommendation 21: The State, in coordination with federal entities, should ensure that existing flood control structures are properly maintained. Further, in addition to its current dam inventory and regulation program, the State should initiate and maintain a comprehensive inventory and regulation system for all levee systems, regardless of ownership, that have potential impacts on public safety. In addition, as part of the USACE Delaware River Basin Comprehensive Feasibility Study, consideration should be given for new structures only when economically justified and environmentally appropriate.

Maintenance of smaller flood control facilities including dams, levees, and other water control structures is the responsibility of either state, county, local governments, or private individuals. Water supply and hydropower reservoirs, and many small privately owned dams, although not designed for flood control, carry similar operating and maintenance needs. The Basin States each fund dam inspection programs which are critical to the protection of downstream citizens. Protection of funding for these programs is a necessity, in addition to securing funding for maintenance. There is a need for repair or removal of those structures not meeting current safety standards. Federal funding for the USACE flood control reservoirs must be protected, along with that of the Federal Energy Regulatory Commission, which has regulatory oversight of the large hydropower dams.

The State should make available incentive-based funding for county and municipal operation and maintenance activities on existing flood protection infrastructure including dams, channels, levees, tidegates, and pump plants. The State should provide funding to county and municipal governments for the funding of the local share of Federal flood mitigation grants and projects. This would apply to federal funding from all federal agencies including USACE, FEMA and the NRCS.

Small local flood control projects that may be beneficial for prevention of stream tributary flooding should be investigated. Backwater flooding along the stream tributaries could be controlled and prevented through the use of structural measures along the existing levee system including flap gates, tide gates, and pumping stations.

The USACE, in its 1984 Delaware River Basin Study Survey Report, undertook the most recent basin-wide screening of flood control structural and non-structural project alternatives. The Task Force recommends that, as part of the Delaware River Basin Comprehensive Feasibility Study, an update be undertaken that would provide a means for evaluating, from a multi-state perspective, the effectiveness and feasibility of such measures.

Implementation 21: Municipalities, Counties, USACE, NJDEP-Engineering & Construction, Legislation

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Finding 22: The Delaware River overtopped the Canal embankment from its inlet at Bulls Island in Kingwood Township downstream beyond Lambertville causing extensive damage to bridges over the Canal and the embankment to varying degrees.

Questions have been raised as to the impacts of the Canal on flooding in Stockton Borough and the City of Lambertville. Specifically the questions related to the breach of the Canal in Stockton and the operation of the gates at the Lambertville Lock and the Swan Creek Aqueduct as well as cleaning debris from the gates.

Canal Embankment Breach in Stockton: The overtopping breached the embankment between the Canal and the river at station 163+ in Stockton Borough, approximately 1500 feet upstream of Bridge Street. The breach was approximately 108 feet long and 13 feet deep. The depth of overtopping at this location was at least 1.7 feet based on pictures of the flooding at the Prallsville Mills. The Prallsville Mills property is located just north of the Prallsville Lock and Stockton Borough. The Prallsville Lock was overtopped on Sunday, April 3, 2005 well in advance of the peak on Monday, April 4th. The elevation of the embankment upstream of Bridge Street is approximately 81. The water level in the town was reflective of the water level in the river with or without the breach since the embankment is the high point separating the town and the river.

Operation of the Lock Gates in Lambertville: Authority staff as requested by the City took elevations of flood marks in Lambertville. The water elevation at the hotel on the banks of the Delaware River was 68.4 feet NGVD. The water elevation on the United Water Pumping Station was 68.6 feet NGVD and on the Municipal building was 68.7 feet NGVD.

The Swan Creek Aqueduct includes two gates and a spillway on the Town side of the aqueduct. The elevation of the spillway is 65.9 feet NGVD. There is also a spillway on the riverside of the aqueduct at elevation 67.7 feet NGVD. Opening the gates in the aqueduct would have allowed more water to enter the Canal from the river since the river elevation was higher than the spillways on either side of the aqueduct.

There is also a spillway between Buttonwood and Perry Streets in Lambertville. The elevation of this spillway is 68.2 feet NGVD. The Alexauken Creek Aqueduct on the north side of town was also in backwater from the Delaware River.

Water was entering the Canal at each of these four structures and could not be reduced by opening the gates at the lock.

Approximately 1600 feet downstream of the aqueduct is the Lambertville Lock. In between the aqueduct and the Lock, is a backrace that allows water to bypass the lock. The backrace assumes the water level downstream of the lock when it is closed. During the storm event the Canal embankment was overtopped from just downstream of the lock downstream to the Mercer County Workhouse.

Recommendation 22: The New Jersey Water Supply Authority (NJWSA) should continue to remove accumulated debris at the locks and bridges before and after storm events along the Delaware and Raritan Canal in Stockton Borough and the City of Lambertville, Hunterdon County.

Prior to the April 2005 storm event, the NJWSA Canal Operations staff made sure that locks and bridges were cleared. Shortly after the storm event, maintenance crews began to remove accumulations of debris along the entire reach of the Canal with a primary focus on locations that were backing up water levels. A number of bridges over the Canal were

damaged during the storm event and restricted access for work crews. Debris that could not be removed safely at these locations was passed down canal to where it could safely be removed.

Implementation 22: NJWSA

Planning and Additional Resources are Needed to Reduce Flood Risk

Finding 23: **The State does not have an Enhanced State Hazard Mitigation Plan.** The FEMA Hazard Mitigation Grant Program (HMGP) provides funding to states in an amount equal to 7.5% of all the FEMA funds spent on Individual and Public Assistance for any particular disaster declaration to fund hazard mitigation projects. The state must possess an approved Standard State Hazard Mitigation Plan to be eligible.

If a state has an approved Enhanced Hazard Mitigation Plan, up to 20% of all the FEMA funds spent on Individual and Public Assistance for any particular disaster declaration could potentially be granted to fund hazard mitigation projects.

The State's hazard mitigation plan is currently at the standard level. This qualifies the State for the 7.5% grants. The NJOEM Mitigation Unit in cooperation with members of the State Hazard Mitigation Team (SHMT), which is comprised of multiple state agencies, completely revised the State Hazard Mitigation Plan in 2005. As per NJ Executive Order #115, the State Hazard Mitigation Team has a responsibility for guidance of mitigation initiative, policy, statewide criteria, projects and planning acceptance and prioritization. Based upon the arduous task of meeting FEMA requirements and internal staffing restrictions, NJOEM was only able to revise the plan in accordance with the requirements of a Standard State Plan format.

The HMGP has provided the State with approximately $1,000,000 from the Burlington County Flood (1530-DR-NJ), $521,000 from the September 2004 Delaware River Flood (1563-DR-NJ) and will provide $193,073 from the April 2005 Delaware River Flood (1588-DR-NJ). The State is eligible for administrative and management costs under this program.

The State has one year from the declared disaster to submit projects to be funded by these hazard mitigation funds.

For Disaster 1530-DR-NJ, of all projects reviewed, 8 were submitted to NJOEM and reviewed in conjunction with FEMA. All but one was considered ineligible. The project that was accepted by FEMA is expected to utilize all monies available for this disaster. Burlington County has successfully applied and has been approved for a HMGP planning grant to develop a "all hazards" multi-jurisdictional mitigation plan under. Opportunity has allowed the use of limited Flood Mitigation Assistance (FMA) planning funds to develop the flood portion of this plan.

Currently, the NJOEM Mitigation Unit is effectively managing all mitigation programs in accordance with FEMA requirements. All grant applications that have been submitted to FEMA for consideration have been for projects that are technically feasible and eligible under FEMA's general guidelines. Historically, FEMA did environmental reviews and cost-benefit analyses for applications submitted by NJOEM. In order to achieve enhanced plan status, NJOEM is required to conduct these reviews prior to submission. All quarterly financial and progress reports are submitted to FEMA prior to their quarterly due date. Work in progress has been demonstrated by advising FEMA of on-going actions for each open project in the quarterly progress report and all grants are closed out within 90 days of end of performance periods.

Recommendation 23: The State must do whatever is necessary to develop and have an Enhanced State Hazard Mitigation Plan approved by FEMA. The potential increase in hazard mitigation grants from 7.5% to 20% is significant and would positively impact the state's efforts to reduce flood damages.

It is the goal of the Mitigation Unit and the SHMT to continue to revise the State Hazard Mitigation Plan to meet FEMA requirements for the next submission in April 2008. Obtaining enhanced plan status for NJ is a goal of the NJOEM Mitigation Unit. The development of an Enhanced State Hazard Mitigation Plan is not a "single agency" undertaking. It will involve the cooperation and coordination of all the members of the

SHMT. At the SHMT meeting on April 12, 2006, this issue was raised while discussing what has to be done to maintain the standard plan.

In order to meet enhanced plan status, the state must strengthen the NJOEM Mitigation Unit so that it can comply with several key requirements. An enhanced plan will require the state to conduct all benefit cost analyses and environmental impact reviews. Current staffing levels currently prevent this capability. The enhanced plan also requires the demonstration of a system to revisit each completed mitigation project and conduct an assessment of the effectiveness (actual cost avoidance) of each mitigation action. This requirement is currently unattainable with existing staffing levels.

Implementation 23: NJOEM, FEMA, SHMT

Finding 24: In the past four years, the State has utilized some of the available FEMA FMA planning and technical assistance grant funds, and has returned the remainder of the FMA project grant funds to FEMA for lack of use. FEMA's FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) (NFIRA) with the goal of reducing or eliminating claims under the NFIP. Funding for the program is provided through the National Flood Insurance Fund. FMA is funded annually at $20 million for the entire nation. The State is eligible for approximately $700,000 per year, with the majority being designated for projects.

There are three types of grants available under FMA. Planning Grants are available to states and communities for Flood Mitigation Planning. Project Grants are for NFIP-participating communities with approved Flood Mitigation Plans to implement measures to reduce flood losses, such as elevation, acquisition, and relocation of NFIP-insured structures. Technical Assistance Grants are represented by 10 percent of a FMA Project Grant and is available to states to help administer the program. The grants are 75% federal/25% non-federal cost share grants.

Four FMA projects were in counties affected by recent flooding: a $393,975 federal share grant for the buyout of 3 structures along the Pascack Brook in Hillsdale Borough, Bergen

County; a $297,187 federal share grant for the buyout of 3 structures along the Passaic River in Lodi Borough in Bergen County; a $432,082 federal share grant for the buyout of 4 structures along the Rockaway River in Boonton Town, Morris County; and a $214,834 federal share grant for the elevation of 3 structures along the Delaware River in Branchville Borough, Sussex County.

Currently, FMA planning funds have been requested to the maximum. 2005 Technical Assistance funds were awarded to NJOEM to hire a part time assistant to promote the FMA program. 2006 FMA planning funds are being utilized to their fullest extent to augment the more comprehensive Pre-Disaster Mitigation (PDM) planning efforts. The Delaware River Basin Commission through NJOEM has made application for flood mitigation planning for the four northern counties under its jurisdiction (Sussex, Warren, Hunterdon and Mercer). These FMA plans will assist each county with the required flood mitigation information that will be necessary for their PDM plan.

The Mitigation Unit solicits applications from all eligible communities for potential FMA projects. Workshops are held to explain the program and eligibility for a grant. The 2005 workshop had poor participation from eligible communities. Frequently the applications received are for projects that do not meet the eligibility requirements. Therefore, those applications cannot be considered for funding. (see project sheet ref. FMA project funds).

Municipalities are required by FEMA to have an approved PDM plan in order to be eligible for hazard mitigation funding under the Hazard Mitigation Grant Program following a presidentially declared disaster, or under the annual PDM-C program. A PDM plan covers all natural hazards, including flooding. Since an FMA plan will only make the municipalities eligible for an FMA project grant, FMA plan continuation is of limited value. Planning funds can be utilized to further fund eligible projects. FEMA will not fund two separate standalone FMA and PDM plans for the same community. They will fund FMA flood planning if it addresses the flood component of a PDM plan. NJOEM is prioritizing PDM all hazards plan development throughout the state to satisfy Disaster Mitigation Act 2000 requirements.

Recommendation 24: The State must maximize it use of the FEMA FMA grants to enhance its flood protection mission. In order to assist communities, which may lack funds to support a local share, the state and local leadership must work with the legislature to develop a dedicated funding source to assist local governments in funding local shares of federal mitigation grants. Although "all hazards" planning is the top priority at this time, municipalities with specific flooding issues should not be discouraged from continuing to look at specific flood mitigation planning in addition to their "all hazards" planning. The NJOEM Mitigation Unit is actively working with NJDEP Green Acres to attempt to secure funding for the local 25% match for those municipalities that receive grants for acquisition projects. The Green Acres program may provide the 25% matching share for communities that acquire repetitive loss properties in flood prone areas under the condition that the land acquired be maintained as open space.

Implementation 24: Municipalities, Counties, NJOEM, FEMA, NJDEP-Green Acres

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Finding 25: The State has not been successful in utilizing and competing for FEMA Competitive Pre-Disaster Mitigation Grants. PDM-C's were authorized by §203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act. The program provides competitive grant funds to states, territories, Tribal Nations, communities, colleges, and universities for pre-disaster mitigation planning and the implementation of cost-effective mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM-C's can be utilized to cover mitigation planning and projects, information dissemination activities directly relating to planning or projects and applicant and sub-applicant management costs. The grants are 75% federal/25% non-federal cost share grants. Small, impoverished communities may be eligible for up to a 90% Federal cost-share.

The State received a $400,000 planning grant in FY 2002 to fund the development of portions of the State Mitigation Plan and for eight multi-jurisdictional county plans. Stevens Institute, in conjunction with NJOEM, produced a standard state hazard mitigation plan

which was approved by FEMA Region II. Regretfully, the eight multi-jurisdictional county plans were not successfully completed and approved. One local municipal plan was developed by Stevens Institute and has been FEMA approved. The majority of the grant was not paid due to Stevens Institute being unable to meet deliverables. NJOEM and FEMA have developed an alternative plan to utilize the PDM-C planning grant program to develop eighteen multi-jurisdictional county -wide "all hazard" mitigation plans. Two counties (Essex, Hudson) in conjunction with NJOEM have successfully applied for and were granted 2005 PDM-C planning grants. We anticipated successful completion, adoption and approval of these plans via a reputable contractor and FEMA before September 2007. Without approved mitigation plans, local communities are not eligible for mitigation project grants under this program.

The FY 2003 PDM planning project for the NJ Department of Human Services was recently completed. The Hazard Analysis of the 40 state-owned facilities was recently received by NJOEM, and sent to FEMA for approval.

An FY 2003 PDM $1,000,000 project grant was awarded to Carneys Point for development of a pump station and upgrade. This project is moving forward and expected to be completed on time in October of 2006.

In FY 2004, PDM funds were not available nationally. Ultimately they were combined with FY 2005 PDM funding at the national level.

FY 2005 PDM planning funds were awarded to Essex and Hudson counties for the development of county wide all hazard PDM plans. The planning effort for both counties is on schedule. These two grants are in excess of 2 million dollars.

FY 2006 PDM planning efforts were encouraged by the NJOEM Mitigation Unit which held workshops throughout the state to solicit applications from all counties without a funding mechanism for PDM plan development. Eleven counties applied for 2006 PDM planning grants. A second workshop was held for those counties to provide assistance with the e-grants application. PDM-C program regulations stipulate that NJOEM could only submit five applications for consideration. NJOEM chose the top five counties that have the highest

number of flood insurance claims paid, and therefore, the most flooding in the state. Population and population density was also a consideration. All applications have been submitted to FEMA.

Recommendation 25: A strengthened hazard mitigation program within NJOEM would allow the state to aggressively compete for FEMA PDM grants. While widespread shortcomings were revealed and the FY 2002 PDM grant failed on many levels, NJOEM in conjunction with FEMA has addressed their particular deficiencies and has taken corrective actions. The NJOEM Mitigation Unit has altered their methodologies and has achieved some success.

Additional staffing for the NJOEM Mitigation Unit would allow for a more aggressive approach to FEMA mitigation grants. Additional staff would also ensure proper oversight and management of all current and future mitigation projects.

Evaluate and compare staffing levels from other states including the Pennsylvania Emergency Management Agency (PEMA) and Delaware Emergency Management Agency (DEMA).

Implementation 25: NJOEM, FEMA

Finding 26: FEMA's post-disaster funding formula is inequitable and precludes areas in need from being considered for assistance. In the federal disaster declaration for the April storm, the State and the counties involved in the declaration were not considered eligible for public disaster assistance. Pennsylvania and its Counties were considered eligible. For the previous Delaware River flood in September 2004, the State and its declared counties did receive public assistance. Local governments have questioned the fairness of the funding formula in which FEMA uses to determine eligibility.

In accordance with 44CFR sec 206.48, FEMA uses two per capita figures to calculate a threshold for disaster declarations. They are based on the Consumer Price Index and change

every year on October 1. There is one figure for the entire state and another for counties. FEMA multiplies the state population for the 2000 census to arrive at the State threshold. They do the same for each county. The September flood, DR-1563, was in the Federal FY 2004. Their ratios were 1.11 for the state and 2.77 for the counties. The FY 2005 ratios are 1.14 for the state and 2.84 for the counties.

There were substantial reductions in the riverfront town claims for road damage in the April storm. Some of their claims included Federal Highway Administration (FHWA) roads; other claims were for roads with prior existing damage. New Jersey did not have sufficient damage outside the Delaware River to warrant a declaration based on FEMA's calculations.

Recommendations 26: Eligibility is determined by rule. State and local leaders must reach out to the US Congress and Senate to support a change in the FEMA methodology for determining eligibility for disaster assistance to assure fairness across state and local boundary lines.

Implementation 26: Federal Legislation

Finding 27: Improvements are needed to address flood warning deficiencies in the Delaware River. The NWS prepares and issues flood watches and warnings before and during floods and have helped save lives and protect property, and the Task Force recognizes the NWS for its service. NWS flood warning and New Jersey Weather and Climate Network products proved extremely valuable in the 2004 and 2005 floods. Improvements in communications, and in precipitation and stream gage network density and reporting technology, will assist the NWS in its efforts to achieve its mission of protecting life and property.

The overall goal of eliminating flood losses drives numerous structural, non-structural, and regulatory programs. Yet flood warning remains the necessary day-to-day means of identifying and reacting to immediate flood threats. Flood warning will continue to be necessary as long as floodplains are occupied. The existing flood warning and emergency

system in the basin has resulted from a partnership of federal, state, local and private organizations. Adequate flood warning is especially vital to those professionals and volunteers who are responsible for flood evacuation efforts, such as emergency and rescue personnel. Early warning is crucial in protecting residents in flood-prone areas. Early warning enables residents and businesses to secure property, to the greatest extent possible, and move to safety.

Effective flood warning can reduce economic flood losses by up to 10 percent and, in particular, reduces the loss of life due to flooding. The benefit to cost ratio of flood warning improvements in the neighboring Susquehanna River Basin has been estimated at 12.5 to 1 by the NWS. In addition, the precipitation and stream gages used for flood warning produce many additional benefits in water resources management and risk assessment.

During the flooding in March and April 2005, the NWS, USGS, DRBC, and the Office of the State Climatologist's (ONJSC) web sites with real-time flood data had many millions of hits. The general public who wanted to monitor conditions near their homes generated more than half of these hits.

Recommendation 27: The State, in partnership with other state and federal entities, should coordinate the implementation of improvements to flood forecasting and flood-warning system capabilities.

The DRBC FAC, comprised of eighteen different organizations responsible for flood loss reduction, has identified two categories of flood warning deficiencies in the basin. The first category focuses on immediate equipment deficiencies. The second category includes general needs related to monitoring, modernized technology, and improved public outreach. To address the deficiencies, the DRBC staff, with the guidance of technical experts serving on the DRBC FAC, outlined measures in the DRBC's "Recommendations to Address Flood Warning Deficiencies" including:

a. Expansion of the USGS stream and precipitation gage network, and plan for the long-term financial support needed to maintain the network.

b. Accelerated development of the Advanced Hydrologic Prediction Services (AHPS), such as inundation mapping, by the NWS in partnership with federal, state, and local agencies.. The AHPS products are on-line and represent the biggest improvement in the availability of flood forecasting information in decades. Providing timely and accurate forecasts of river stage and flow is the backbone of the flood-warning system.
c. Increase NWS, USGS, and USACE funding for the development of flood stage forecast maps to be integrated with AHPS.
d. Support the distribution and use of the NOAA Weather Radio, a 24-hour broadcast by the NWS that includes instantaneous alerts of flood watches and warnings.

Funds are also needed for upgrading and operating the New Jersey Weather and Climate Network (NJWxNet; http://climate.rutgers.edu/njwxnet). This network provides real time monitoring of precipitation and other atmospheric conditions across the New Jersey, thus improving flood-warning capabilities. The NJWxNet, operated by the ONJSC at Rutgers University, serves as a comprehensive information resource for weather forecasting and weather-related decision making in the Garden State, and also through this initiative, will serve as a location for the dissemination of river and tidal information and warnings. NJWxNet is a unique network of networks, including data gathered from approximately 50 stations operated by the ONJSC, along with approximately 100 stations maintained by other agencies and institutions within NJ and dozens of others in adjacent regions. The ONJSC is uniquely qualified to operate the NJWxNet. Office staff has technical expertise in station installation and maintenance, data management and display, and geographic information systems, experience in training public safety officials, and possess detailed knowledge of the weather and climate of New Jersey.

Implementation 27: DRBC, NWS, USGS, USACE, NJOEM, NJDEP

Finding 28: The NFIP Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management

activities that exceed the minimum NFIP requirements. The NFIP is based on a mutual agreement between FEMA and the community whereby Federally backed flood insurance is made available in those communities that agree to regulate development in their mapped floodplains. Through the voluntary participation in CRS, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. For CRS participating communities, flood insurance premium rates are discounted in increments of 5%; i.e., a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount (a Class 10 is not participating in the CRS and receives no discount). The CRS classes for local communities are based on 18 creditable activities, organized under four categories: (i) Public Information, (ii) Mapping and Regulations, (iii) Flood Damage Reduction, and (iv) Flood Preparedness.

Of the 545 communities state-wide participating in the NFIP, only 11% are participating in the CRS program. No communities along the Delaware River are currently participating in this program.

Recommendation 28: The state should work with municipalities, not only in the Delaware and Passaic Basins, but all over the state to increase participation in the CRS program.

Implementation 28: NJOEM, FEMA, NJ Department of Banking and Insurance (NJDBI), Municipalities

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Finding No. 29: The New Jersey Legislature, through the Emergency Flood Control Bond Act (P.L. 1978), provided the NJDEP with funding for state flood control grants and flood control planning. These funds have since been exhausted.

In order to provide a unified approach through which the NJDEP could continue the flood control efforts initiated under the Emergency Flood Control Bond Act, a Statewide Flood

Control Master Plan was created in 1980. This Master Plan had provided the NJDEP with the initial data base from which to assess needs and priorities, and a programmatic process by which the NJDEP can serve as an expediter to aid municipal governments in finding relief from flood damage potential.

Recommendation 29: The State's agency for coordinating long-term flood control and flood mitigation activity planning and implementation should form an on-going State-wide Flood Advisory Committee, similar to the DRBC FAC. Committee membership should be made up of representatives of NJDEP, NJOEM, Passaic Flood Warning System Users Group (PFWUG), FEMA, USACE, NRCS, NWS, USGS, and other agencies and organizations including representation from individual citizens. NJOEM's existing "HydroMet" advisory group could either be expanding into the Flood Advisory Group or could serve as the Monitoring and Warning Subcommittee of the Flood Advisory Group.

The State, with the assistance of the Flood Advisory Committee, should redevelop the State Flood Control Master Plan (last developed in 1980). The Plan should identify and prioritize needs for flood mitigation planning and/or implementation requests for federal assistance anywhere in the state as well as prioritize state funding received through bond acts or other sources. The Plan should also develop a priority/ranking system for providing all federal and state flood mitigation planning and implementation technical and financial assistance which includes the following:

- Record of past flooding
- Availability of county/municipal and/or property owner funding
- Municipal participation in the NFIP
- Municipal participation in the CRS
- Status of hazard/flood mitigation plan
- Record of code enforcement for the flood plain
- Operation and maintenance of existing flood protection infrastructure

Implementation 29: Legislation needed

Finding 30: The **NJDEP's new stormwater rules, will help reduce flooding incidents by requiring new development designs to recharge rainfall into groundwater. Recharging underground aquifers not only bolsters drinking water supplies and mitigates the effects of droughts, but also reduces the amount of rainwater that quickly runs off during storms, leading to flooding such as New Jersey experienced today.** The stormwater rules also protect the quality of New Jersey's drinking water by limiting the amount of pollution carried by flooding and normal stormwater into lakes and streams. Municipalities are required to take common sense steps to reduce non-point source pollution, additional planning and implementation at the municipal level is also required to provide additional flood mitigation.

Recommendation 30: The State's municipal authorities law must be amended to give municipalities the option of establishing a stormwater management utility or similar entity to manage and improve stormwater management from existing development, and to facilitate access to the New Jersey Environmental Infrastructure Trust for local flood control projects.

Implementation 30: Legislation needed

Finding 31: Several large impoundment reservoirs and control structures which have the potential to cause severe flooding to the Delaware River in the event of a catastrophic dam breach failure are located within the Delaware River Basin in New Jersey, Pennsylvania, and New York State.

An Emergency Action Plan (EAP) is a document that contains information to be used by emergency management coordinators and personnel in the event of a sudden dam failure or the uncontrolled release of stored water. The standard text of an EAP includes emergency notification flowcharts and information; statement of purpose; project description; emergency detection, evaluation, and classification; general responsibilities; preparedness; dam inundation mapping; plans for training, exercise, updating and posting; and approval and distribution information. Dam inundation mapping is the key component of the EAP

document since it clearly illustrates the extent and timing of potential downstream impacts during a dam breach or uncontrolled release of water event. Emergency management coordinators and personnel rely heavily on the dam inundation mapping during an emergency situation.

The dam owner is responsible for the preparation and maintenance of the EAP document. Regulatory authority in the Delaware River Basin over the dam owner's responsibilities may lie within several federal and state agencies including the Federal Energy Regulatory Commission (FERC), the NJDEP, the Pennsylvania Department of Environmental Protection (PDEP), and the New York State Department of Environmental Conservation (NYSDEC).

Recommendation. 31: The owners of dams located within the Delaware River Basin in New Jersey, Pennsylvania, and New York State should prepare and maintain a current EAP document with associated up to date dam breach inundation mapping. The DRBC should coordinate and ensure that EAP documents for all large impoundments within the Delaware River Basin are shared between the states of New Jersey, Pennsylvania, and New York.

The agencies that regulate the large impoundment structures within the Delaware River Basin should ensure that the dam owners are fulfilling their responsibilities of preparing and maintaining a current EAP document. Keeping the EAP up to date requires that any future changes be incorporated into the text and dam inundation mapping and that training, updating, annual exercising, and posting take place on an ongoing basis. The dam owner must involve local, county and state emergency management coordinators and personnel, state and federal regulatory agencies, and the DRBC in the preparation, update, and annual exercise of the EAP document.

The DRBC, NJOEM, NJDEP, County OEM, and local OEM offices should be prepared to use the Emergency Action Plans (EAPs) and dam inundation mapping for the dam impoundments located within the Delaware River Basin that may have an impact in New Jersey.

Implementation: 31 DRBC

Homeowners Need Focused Assistance Before and After Flooding

Finding 32: **The need for improved communications at all levels of flood plain management- federal, state, county and local as well as the transfer of information from agencies to the public before, during and after a flood event was an underlying need expressed by flood victims.** During the last two floods on the Delaware River, flood victims sought information and were uncertain what agencies to turn to for flood information, including flood prevention and recovery.

Citizens and local emergency responders indicated a need for a single point of contact to provide upfront information and education to residents, local officials and local emergency responders on flood management and recovery. They also expressed a need for methods and materials to assist communities in this effort.

Recommendation 32: The State should consider the appointment of a "flood ombudsman" to handle issues that arise between flood victims and other entities and to manage the aftermath of a flood event and coordinate information between agencies. The "flood ombudsman" would work closely with the State Hazard Mitigation Officer (SHMO) and the State NFIP Coordinator on immediate relief and mitigation efforts. Consideration should be given to providing the Office of the New Jersey Public Advocate with this role.

Provide assistance to local communities in developing a communication plan to supplement and complement the successful implementation of local emergency response plans. The communication plan could include points of contact not only for emergency responders but also for citizens. Citizens should participate in the development of such plans and be made aware of management issues associated with flooding before, during and following a flood event. Additionally, the emergency management warning system at the local level could be

improved by annually publicizing the plan, the role of the agencies involved and the role and responsibility of the public in following the plan. An effort should be made to advertise the importance of having NOAA Weather Radios (NWRs) available, particularly during potential weather-related power outages, since most are equipped with battery back-up capability.

Require that counties provide copies of flood emergency response plans to the NJOEM Preparedness Unit to ensure that all communities have access to and are aware of the most up-to-date and state of the art early warning systems, technical support and education programs.

Require that local officials and emergency response managers participate in education programs such as Situation Awareness training offered by the NWS and coordinated through NJOEM Preparedness Unit which outlines for citizen's antecedent conditions, the needed behavior response and the subsequent consequences should the behavior not happen.

As part of the communication plan, create a flood information methods and materials for communities that would provide information on:

- state and federal regulations, model ordinances for local governments on land use planning to direct development away from flood prone areas:
- flood prevention and preparedness literature for homeowners;
- financial and insurance information and techniques to safeguard against flooding in the home;
- explanation of confusing terminology such as 100 year flood;
- contact numbers of relevant agencies, such as NJOEM, DRBC, NWS, FEMA, and USACEfor citizens to obtain literature and information about flood prevention, preparation and mitigation;
- contacts for medical assistance and counseling services following flooding;
- information on how to bring property into compliance with flood mitigation standards;

- explanations of the differing requirements between federal, state and local regulators;
- information on how long the process for recovery will take;
- fully implement and promote the NWS's StormReady program and encourage communities to receive StormReady designation.

One strategy for delivering information about the methods and materials is through the homeowner assistance centers set up for flood victims. However, other proactive delivery channels should also be pursued.

Identify a local contact for agencies to work with and for residents to contact who can explain, mediate and help resolve specific issues that arise between victims, regulators, mortgage companies, insurance brokers and others involved in the flood mitigation process.

At the state level, provide flood mitigation and recovery information to the affected public annually and act as a coordinator between the public and private organizations that are involved in flood mitigation.

Provide post-flooding training workshops on disaster assistance paperwork and procedures for local officials and expand NJDEP's role as FEMA advisor to code officials, to include flood managers and homeowners.

Working with the League of Municipalities, Association of Counties and County Environmental Health Act (CEHA) agencies develop a training program on flooding that can be provided to municipal officials in flood prone areas annually.

Develop and implement a quarterly floodplain management newsletter to be targeted to local floodplain managers (as identified in the local floodplain ordinance), code enforcement officials and emergency management coordinators.

NJOEM should conduct on-going outreach to the 26 municipalities with existing Flood Mitigation Plans and encourage them to carry out the plans via financial incentives to reduce flood losses.

Local governments should be required by regulation to identify a contact annually that will be the point of contact to receive flood-related information from NJDEP. This will provide a mechanism to ensure that state efforts to provide ongoing education to the municipalities are reaching the right local people.

Fully utilize the NOAA Weather Radio, a 24-hour radio broadcast by the NWS. Current weather forecasts and warnings are available; some radios have a 'tone-alert' feature which sets off an audible alarm when a warning is issued by the NWS; New Jersey has excellent NOAA Weather radio coverage with 100% coverage along the Delaware River. NOAA Weather Radio is ideal for situation where commercial power is out and where access to media and/or Internet is limited.

During a Presidentially-declared disaster, the NJOEM Mitigation Unit should continue to conduct applicant briefings for local governments and offices of emergency management in the declared counties. These briefings explain hazard mitigation funding that is available and encourage participation. It is the responsibility of the local government to distribute the information to the communities and encourage participation. FEMA and NJOEM also staff Disaster Relief Centers, which provide the public with pertinent information regarding mitigation programs, funding and measures. The NJOEM Mitigation Unit also conducts hazard mitigation program workshops annually throughout the state to encourage municipalities to participate in all available mitigation grants. The Mitigation Unit partnered with NJDEP Coastal Hazards and conducted a workshop on April 18, 2006 at Ocean County College to address Coastal Hazards and Mitigation Planning. Additionally, the Mitigation Unit notifies all eligible communities of non- disaster related mitigation grant funding as soon as it is made available.

Implementation_32: NJOEM, FEMA, NJDEP-Engineering & Construction, NJDEP-Land Use Regulation Program, Municipalities and Counties

Finding 33: **Property owners may first become aware they are living in a flood prone area either after they have experienced flooding or when a lender for a federally insured mortgage company requires flood insurance.** Although these homeowners are required to prove they are not in a flood plain, other mechanisms need to be in place for those people buying homes with cash and for those cases where no buildings exist onsite which indicate that flooding could occur. Likewise, for those homeowners who do have flood insurance, they may be unaware of the actual potential for flooding and actions that they can take to minimize damage.

Recommendation 33: The State should adopt flood hazard disclosure requirements for all real estate transactions. To the extent that a current property owner is aware of the flood history of a site, these facts should be made known to any potential buyers of the property either by the property owner or the realtor responsible for selling the property. The existence of permits or other documentation from the NJDEP, flood insurance records, easements onsite or tax records should be part of the disclosure requirements. Additionally, flood insurance companies should provide reminders to their policyholders, at the time of policy renewal that they live in a flood prone area, and include steps they can take to minimize loss.

Implementation 33: Legislation needed, NJDBI

Finding 34: **Although there are numerous web-based sources for information on flood prevention and damage minimization, e.g., FEMA, NOAA, DRBC, etc. a single source for navigating through the myriad of information sources would assist New Jersey residents in obtaining flood prevention, mitigation and recovery information.**

Recommendation 34: The website established by NJDEP, www.njfloods.org should be maintained by NJDEP and linked to an NJOEM website that would be part of its ongoing planning function. The website should include "fact sheets" on relevant pre-planning and recovery. Examples might be "Straight Talk on Mold" and "How to Procure Contractor

Services," etc. This website should provide links to FEMA, DRBC, and USGS websites which provide brochures and program information on flood prevention, mitigation and recovery.

In addition to links to agency websites for flood program information, provide links to the NWS for citizens to conduct real time monitoring for early warning information from stream gauges, rain fall calculations, etc. During the flooding in March and April 2005, the NWS, USGS, DRBC and the ONJSC web site had millions of hits. More than half were by the general public who wanted to monitor condition near their homes.

Implementation 34: NJOEM

Finding 35: Flood warning is a necessary piece of flood loss reduction. The NWS estimates flood warning can reduce flood damage by up to 10%. Effective flood warnings provide lead time. Emergency response managers and residents must have sufficient lead time to determine the best course of action to take in preventing flood damage and loss of life.

Recommendation 35: To assist in early warning and evacuation, the State should fully implement the existing "Reverse 911" infrastructure. While funding and maintenance of the system has postponed or delayed full implementation of Reverse 911, a sustainable funding source for this resource should be identified. USACE is willing to participate in any future endeavors in order to provide lessons learns on implementation of a similar system on the Susquehanna River which was recently established.

Implementation 35: NJOEM

Finding 36: NJOEM, Preparedness Unit currently works with agencies at federal, state and local levels to support the development of Automated Flood Warning Systems (AFWS).

It convenes the "HydroMet" advisory group of Federal, State and local experts to provide planning guidance for the state. There is an existing Five-Year Plan, currently in Year 2.

Recommendation 36: Funding to the NJOEM Preparedness Unit is needed for statewide coordination and support of AFWS. Currently all funding comes from grants (FEMA's Emergency Management Performance Grant (EMPG) program, grants written to the NWS, etc.). This funding would be used for:

a. operations and maintenance support of stream and rain gages
b. upgrade and support of telemetry.
c. modernization (or implementation if not present) of automated warning systems.
d. public education and outreach (to include the general population, special needs populations, public officials and the media).
e. other related needs such as support of existing "StormReady" program, participation in NFIP's CRS program, state meetings, workshops, and training.

Regulations should be developed to require municipalities and counties to develop multi-hazard hydrologic/meteorological plans. These plans would apply to any extreme meteorological event that may result in flooding, and would focus on 1) ability to observe and identify extreme weather threats, 2) procedures for notifying appropriate agencies (flow chart for municipal notifications), 3) plan for educating the public prior to events, 4) notifying the public in times of emergency, 5) local sheltering plans, 6) mutual aid agreements for response and sheltering, 7) evacuation zones and procedures for evacuating those zones, 8) re-entry plans, and 9) financial management plans (to track expenses for potential reimbursement).

Implementation 36: NJOEM

Finding 37: Fewer than 5,000 people inhabit many of the municipalities along the New Jersey section of the Upper Delaware River (e.g. Lambertville, Frenchtown, Belvidere, Montague, Columbia). The capability of these municipalities to respond

effectively to disasters that occur within their boundaries is strongly limited by the fact that they possess small numbers of professional personnel and insufficient expertise. Most of these places lack the budget and staff resources to cope with extreme events when they occur, much less to be prepared for future events or to plan for measures that might mitigate them. This problem is general throughout the country but its effects are especially severe in home rule states like New Jersey where the responsibility for most land use planning and development decisions is heavily vested in local government units. Hazard-mitigation policies are typically difficult to implement without strong local government that is capable of coordinating complex partnerships of federal, state and local agencies and apply for federal disaster declarations and other forms of federal assistance.

Recommendation 37: The State and counties should seek to increase the efficiency of small local governments in the disaster response and mitigation process. This might be done by encouraging service agreements among small municipalities so that they can pool resources to address common hazard issues; by supporting information assistance through university-based extension programs or their equivalent; by expanding the roles of counties and special districts or special authorities to address hazard mitigation tasks; by grants in aid to municipalities that would cover the costs of hiring appropriate experts on an as needed basis.

Implementation 37: NJOEM, Counties

Definitions

100-Year Flood – The flood that has a 1 percent chance of being equaled or exceeded in any given year. It is also known as the Base Flood.

C1 Waters - Category One Waters of exceptional ecological significance, exceptional water supply significance, exceptional recreational significance, exceptional shellfish resource or exceptional fisheries resource. C1 designation provides additional protections to water bodies that help prevent water quality degradation and discourage development where it would impair or destroy natural resources and environmental quality.

Flood Fringe (FEMA) – That portion of the floodplain that lies beyond the floodway and serves as a temporary storage area for flood waters during a flood. This section receives waters that are shallower and of lower velocities than those of the floodway.

Flood Fringe (New Jersey): (1) The area within the flood hazard area outside the limits of the floodway. (2) The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point along the Delaware River or 0.2 feet elsewhere in the State.

Flood Hazard Area (New Jersey): Area inundated by a flood having a discharge 25% greater than the 100-year flood used to delineate the floodway.

Flood Level - an established gage height at a given location above which a rise in water surface level is defined as a flood for the corresponding river or stream reach. Flood level is usually set at a stage where the river or stream begins to overflow its banks and create a potential hazard to lives, property, or commerce. Flood level may equal or exceed bankfull stage but should rarely be less than bankfull stage.

Floodplain Management Regulations – Zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as floodplain ordinance, grading ordinance, and erosion control ordinance), and other applications of the police power. The term describes such state or local regulations, in any combination thereof, which provides standards for the purpose of flood damage prevention and reduction.

Floodplain Management--The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to, emergency preparedness plans, flood control works, and floodplain management regulations.

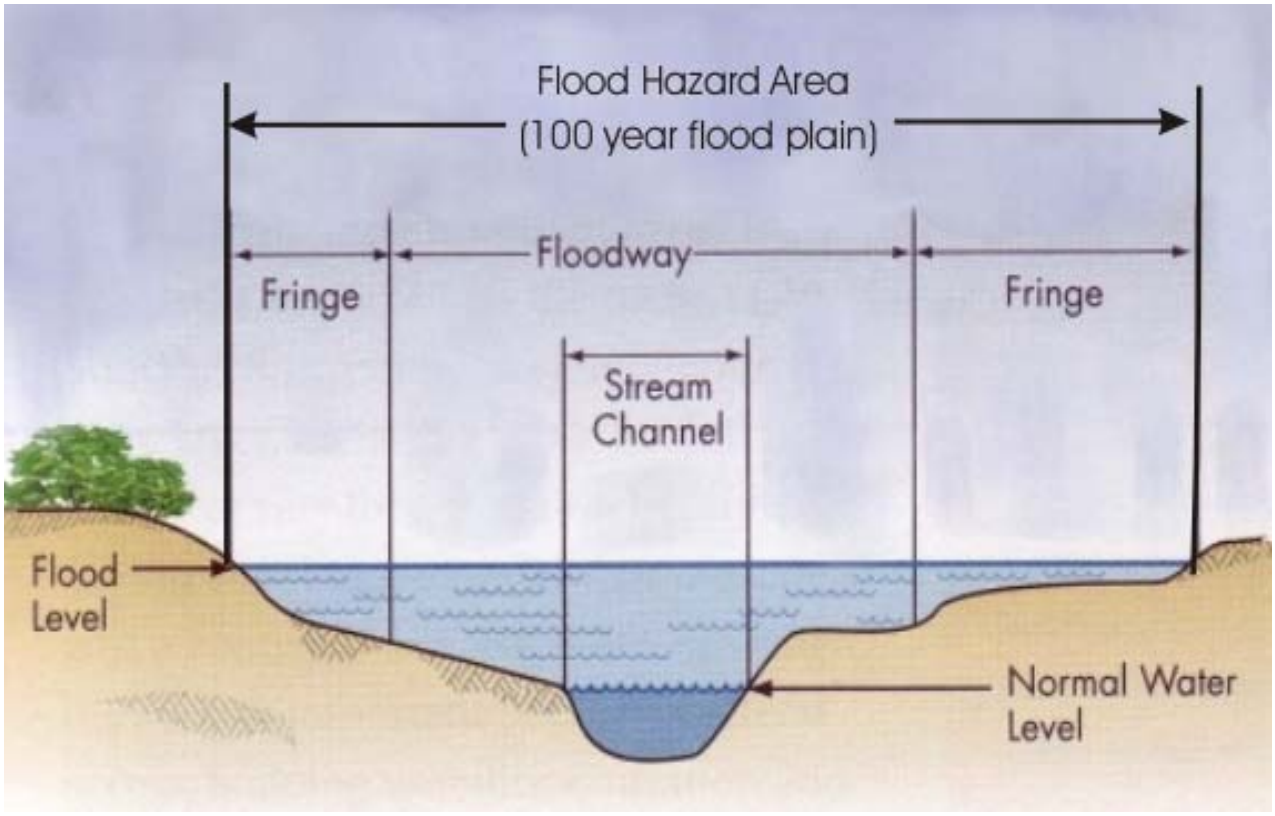
Floodplain--Any land area susceptible to being inundated by waters from any source.

Floodway: The Channel of a natural stream and portions of the flood plain adjoining the channel which are required to carry and discharge the floodwater or flood flow of any natural stream.

Outstanding Basin Waters - interstate and contiguous intrastate waters that are contained within the established boundaries of national parks; national wild, scenic and recreational rivers systems; and/or national wildlife refuges that are classified by the DRBC as having exceptionally high scenic, recreational and ecological values that require special protection.

Special Flood Hazard Area (SFHA)--Darkly shaded area on a Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) that identifies an area that has a 1 percent chance of being flooded in any given year (100-year floodplain). Over a 30-year period, the life of most mortgages, there is at least a 26 percent chance that this area will be flooded. The FIRM identifies these shaded areas as FIRM Zones A, AO, AH, A1-A30, AE, A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO, V, V1-V30, and VE.

StormReady - a National Weather Service program started in 1999 in Tulsa, OK to help arm America's communities with the communication and safety skills needed to save lives and property– before and during the event. StormReady helps community leaders and emergency managers strengthen local safety programs.



Acronyms

AFWS	Automated flood warning systems
AHPS	Advanced Hydrologic Prediction Services
ASFPM	Association of State Floodplain Managers
NJAFM	New Jersey Association of Floodplain Managers
BFE	Base Flood Elevation
C1	Category One Waters
CAFRA	Coastal Area Facility Review Act
CAV/CAC	Community Assistance Visits/Contacts
CEHA	County Environmental Health Act
CRS	FEMA Community Rating System
DEP	New Jersey Department of Environmental Protection
DMA 2000	Disaster Mitigation Act of 2000
DCA	New Jersey Department of Community Affairs
DRBC	Delaware River Basin Commission
EAP	Emergency Action Plan
EIFP	Environmental Infrastructure Financing Program
EMI	FEMA's Emergency Management Institute
EMPG	FEMA Emergency Management Performance Grant
FAC	Delaware River Basin Commission Flood Advisory Committee
DEMA	Delaware Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FMA	FEMA Flood Mitigation Assistance
GSPT	Garden State Preservation Trust Act
HMGP	FEMA Hazard Mitigation Grant Program
IBC	International Building Code
ICC	Increased Cost of Compliance flood insurance coverage
MARFC	Middle Atlantic River Forecast Center (NOAA/National Weather Service)
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101)
NGVD	National Geodetic Vertical Datum
NHR	National Historic Register
NJDBI	New Jersey Department of Banking and Insurance
NJOEM	New Jersey Office of Emergency Management
NJWSA	New Jersey Water Supply Authority
NJWxNet	New Jersey Weather and Climate Network
NOAA	National Oceanic and Atmospheric Administration
NRCS	USDA Natural Resource Conservation Service
NWR	NOAA Weather Radio
NWS	NOAA National Weather Service
NYCDEP	New York City Department of Environmental Protection
NYSDEC	New York State Department of Environmental Conservation

ONJSC	Office of the NJ State Climatologist
PDEP	Pennsylvania Department of Environmental Protection
PDM-C	FEMA Competitive Pre Disaster Mitigation Grants
PEMA	Pennsylvania Emergency Management Agency
PFWUG	Passaic Flood Warning Users Group
SHMO	State Hazard Mitigation Officer
SHMT	State Hazard Mitigation Team
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USGS	US Geological Survey